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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: **Dee et al.**	§	Group Art Unit: **2653**
	§	
Serial No.: **09/894,379**	§	Examiner: **Castro, Angel A.**
	§	
Filed: **June 29, 2001**	§	Attorney Docket No.: **2001-019-TAP**
	§	
For: **Apparatus and Method of Making a Reduced Sensitivity Spin Valve Sensor Apparatus in which a Basic Magnetic Sensitivity is Reduced**	§ § § §	

Certificate of Mailing Under 37 C.F.R. § 1.8(a)
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By: Carrie Parker
Carrie Parker

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Sir:
ENCLOSED HEREWITH:

- Appellant's Brief (in triplicate) (37 C.F.R. 1.192);
- Our return postcard.

A fee of $330.00 is required for filing an Appellant's Brief. Please charge this fee to Storage Technology Corporation Account No. 19-4545. No additional fees are believed to be necessary. If, however, any additional fees are required, I authorize the Commissioner to charge these fees which may be required to Storage Technology Corporation Deposit Account No. 19-4545. No extension of time is believed to be necessary. If, however, an extension of time is required, the extension is requested, and I authorize the Commissioner to charge any fees for this extension to Storage Technology Corporation Deposit Account No. 19-4545.

Respectfully submitted,

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Docket No. 2001-019-TAP

PATENT

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ATTENTION: Board of Patent Appeals and Interferences

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APPELLANT'S BRIEF (37 C.F.R. 1.192)

This brief is in furtherance of the Notice of Appeal, filed in this case on January 20, 2004.

The fees required under § 1.17(c), and any required petition for extension of time for filing this brief and fees therefore, are dealt with in the accompanying TRANSMITTAL OF APPEAL BRIEF.

This brief is transmitted in triplicate. (37 C.F.R. 1.192(a))

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REAL PARTIES IN INTEREST

The real party in interest in this appeal is the following party: Storage Technology Corporation.

RELATED APPEALS AND INTERFERENCES

With respect to other appeals or interference's that will directly affect, or be directly affected by, or have a bearing on the Board's decision in the pending appeal, there are no such appeals or interferences.

STATUS OF CLAIMS

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A. TOTAL NUMBER OF CLAIMS IN APPLICATION

Claims in the application are: 1-36.

B. STATUS OF ALL THE CLAIMS IN APPLICATION

1. Claims canceled: None.
2. Claims withdrawn from consideration but not canceled: None.
3. Claims pending: 1-36
4. Claims allowed: None.
5. Claims rejected: 1-36.

C. CLAIMS ON APPEAL

The claims on appeal are: 1-36.

STATUS OF AMENDMENTS

No amendments were made in response to the final Office Action.

SUMMARY OF INVENTION

The present invention provides a reduced sensitivity spin valve head for magnetic tape applications. (Page 6, lines 5-6.) The present invention compromises a portion of the large

output gain derived from using state of the art spin valve sensors in order to reduce the flux capture and thus, the signal distortion in the spin valve sensor. (Page 6, lines 6-10.) In order to provide a reduced sensitivity spin valve sensor, one or more of the basic sensitivity of the spin valve, the flux carrying capability of a free layer, and a flux injection efficiency of the spin valve head structure are modified to reduce the flux capture by the sensing layer. (Page 6, lines 10-15.)

ISSUES

I. Whether claims 1-6, 10-16, and 20 are properly rejected under 35 U.S.C. 102(b) as being anticipated by Tobise et al. (USPN 5,748,416).

II. Whether claims 1, 7-9, 11, 17-19, and 21-26 are properly rejected under 35 U.S.C. 102(b) as being anticipated by Miyauchi et al. (USPN 5,852,533).

GROUPING OF CLAIMS

For the reasons outlined below, the claims are broken into the following groups:
Claims 1-6, 10-16, and 20 are Group A.
Claims 7-9, 17-19, and 21-26 are Group B.

ARGUMENT

I. 35 U.S.C. § 102, Anticipation

Tobise (Group A)

The examiner has rejected claims 1-6, 10-16 and 20 under 35 U.S.C. § 102(b) as being anticipated by Tobise et al. (U.S. Pat. 5,748,416). This rejection is respectfully traversed.

As per claims 1-6, 10-16 and 20, the office action states:

> Regarding claims 1 and 11, Tobise et al. discloses a reduced sensitivity spin valve sensor apparatus (figure 15), comprising:
> a spin valve sensor; and
> at least one magnetic effect inducing device 21,

wherein the at least one magnetic effect inducing device induces a magnetic field to the spin valve sensor to thereby reduce a sensitivity of a free layer of the spin valve sensor to applied magnetic fields (column 14, lines 45-48).

...

Regarding claim 3-5, 13-15, Tobise shows that the at least one magnetic effect inducing device is a pair or permanent magnet stabilizing elements 21 formed of cobalt-platinum/chromium magnets (see column 13, lines 67, and figure 15).

Regarding claims 6 and 16, Tobise discloses that the at least one magnetic effect inducing device reduces the spin valve sensor's propensity to saturate (column 14, lines 21-27).

Claim 1 is reproduced for reference:

1. (Original) A reduced sensitivity spin valve sensor apparatus, comprising:

a spin valve sensor; and

at least one magnetic effect inducing device, <u>wherein the at least one magnetic effect inducing device induces a magnetic field to the spin valve sensor to thereby reduce a sensitivity of a free layer of the spin valve sensor to applied magnetic fields</u>.

[Emphasis added.]

It is respectfully submitted that the Tobise reference does not teach the claimed limitations of the present invention, and in fact this cited reference specifically teaches away from the claims of the present invention.

The present invention is directed to a reduced sensitivity spin valve sensor, as emphasized in the language of claim 1, above: "...to thereby <u>reduce a sensitivity</u> of a free layer of the spin valve sensor to applied magnetic fields." [Emphasis added.] Also, the present specification states this intended goal in several places. For example, page 4, lines 5-20:

Generally, a variety of different signal flux levels, i.e. levels of the magnetic field generated by the magnetic tape media, can be produce from various data patterns

> recorded on a magnetic tape. For example, low density patterns present a larger magnetic flux to the spin valve sensor leading to higher signal amplitude than high density patterns which have a lower level of magnetic flux. A spin valve head is typically designed and optimized to read the high density patterns in order to have significant amplitude for signal detection. However, the high input flux from a low density pattern can drive a spin valve sensor designed for high density operation into non-linear portions of the spin valve response curve. This leads to readback distortions and may even cause the spin valve sensor to magnetically saturate.

Also at page 5, lines 5-10:

> Thus, it would be beneficial to have a reduced sensitivity spin valve head for magnetic tape applications in which much of the benefits of standard spin valve sensors are maintained while compensating for excessive input flux that may overpower the spin valve sensor.

Such functionality, reducing the sensitivity of the sensor, is beneficial for applications when legacy technology is read by a modern read head. For example, older magnetic media have wider track widths and thus higher magnetic field intensities than newer magnetic media, which have narrower track widths and thus smaller intensities. The art reference Tobise is directed to <u>increasing sensitivity</u> of the read head, so that smaller track widths can be read. However, this increased sensitivity can create its own problems, such as saturation of highly sensitive read heads when older media with wider tracks are read.

Hence, the present invention is directed toward an entirely different problem than the cited references, and produces the opposite result as stated and intended by the cited references.

For example, col. 5, lines 20-23 of Tobise states:

> Further, while Barkhausen noise will be limited, the sensitivity will decrease. Thus, it is necessary to minimize the (Brt) product within a range where Barkhausen noise can be limited <u>without decreasing sensitivity</u>.

[Emphasis added.]

Also at col. 5, lines 43-49:

The object of the present invention is to provide <u>a bias-type MR head using a permanent magnet film to handle narrow recorded tracks and provide a narrow gap so that recording density can be increased. A magnetic head is provided that is highly sensitive and that limits Barkhausen noise by optimizing the magnetic properties of the permanent magnet film.</u>

[Emphasis added.]

These passages of Tobise are reproduced to show that the problem addressed by Tobise is different than that of the present invention, and that the solution to this problem is the opposite to that of the present invention. To wit, Tobise seeks to increase sensitivity while suppressing Barkhausen noise. It therefore attempts to maintain as high a sensitivity as possible, and reduces noise by its selection of magnetic films.

In rejecting the present claims 1 and 11, Examiner cites Tobise at col. 14, lines 45-48:

> Referring to FIG. 9 and FIG. 10, there are shown the changes in output and Barkhausen noise elimination in relation to different values of the (Brt) product. As the (Brt) product increases, the output decreases gradually, and then decreases rapidly at 500 Gmicrons or more.

This passage does not appear to teach the limitations of claims 1 or 11, though it does discuss gradual decrease of the output or sensitivity of the read head. However, this passage continues with lines 48-54:

> It is also sees that Barkhausen noise was not found at 200 Gmicrons or higher. <u>The results from this study indicate that a high output can be obtained and Barkhausen noise can be eliminated</u> for the (Brt) product in the range of 200-500 Gmicrons.

[Emphasis added.]

This passage is reproduced to show that Tobise desires and accomplishes a high output, i.e., sensitivity, for the read head, and not reduced sensitivity.

Examiner also cites Figure 15 of Tobise, noting element 21, a permanent magnet. Though a magnet is a "magnetic effect inducing device," it fails to fulfill the claimed limitations of, "wherein the at least one magnetic effect inducing device induces a magnetic field to the spin

valve sensor to thereby reduce a sensitivity of a free layer of the spin valve sensor to applied magnetic fields," as claimed in claim 1.

Response to Examiner's Arguments:

In the Examiner's final Office action, Examiner addresses arguments submitted by Applicant on 06.27.03:

> The examiner respectfully points out that it is well known in the art that the longitudinal biasing element 21 in the reference reduce the sensitivity of the sensor in addition to the already reduced sensitivity due to the very short electrode spacing (col. 12, lines 31-34). The term "reduced sensitivity spin valve sensor" in the claim is very broad since it is not specified with respect to what or which sensor its sensitivity is reduced.

[Emphasis added.]

Applicant respectfully submits that the term "reduced sensitivity spin valve sensor" in claim 1 is not the only description of reducing spin valve sensitivity shown in claim 1. More specifically, Claim 1, as emphasized above, claims, "wherein the at least one magnetic effect inducing device induces a magnetic field to the spin valve sensor to thereby reduce a sensitivity of a free layer of the spin valve sensor to applied magnetic fields." Hence, the language of claim 1 does in fact specify what part of the spin valve has its sensitivity reduced--a free layer of the spin valve sensor, as recited. This is not mere preamble language, and is presented in the body of the claim, and is intended as a limitation describing the scope of the present invention. Therefore, the cited references, in order to anticipate the present claims, must show this limitation, in the context of the present claims. As argued above, the Tobise reference does not teach this limitation, and instead teaches an increased sensitivity spin valve sensor.

Miyauchi (Group B)

The Examiner has rejected claims 1, 7-9, 17-19, 21-36 are rejected under 35 U.S.C. § 102(b) as being anticipated by Miyauchi et al. et al. (U.S. Pat. 5,852,533). This rejection is respectfully traversed.

As per claims 1, 7-9, 17-19, 21-36, the office action states:

> Regarding claims 1 and 11, Moyauchi et al. discloses a reduced sensitivity spin valve sensor apparatus (figures 3-4), comprising:
>
> a spin valve sensor; and
>
> at least one magnetic effect inducing device 126,
>
> wherein the at least one magnetic effect device induces a magnetic field to the spin valve sensor to thereby reduce a sensitivity of a free layer 121 of the spin valve sensor to applied magnetic fields (column 7, lines 58-64).
>
> Regarding claims 7 and 17, Miyauchi discloses that the at least one magnetic effect inducing device is an antiferromagnet layer (column 7, lines 44-46).
>
> Regarding claims 8-9 and 18-19, Miyauchi discloses that the antiferromagnetic layer generate a longitudinal exchange induced bias free layer that reduces the sensitivity of the free layer to applied magnetic fields (column 7, lines 58-66).
>
> Regarding claims 21 and 29, Miyauchi discloses that the at least one magnetic effect inducing device includes a pair of antiferromagnetic layers 124, 126 (see figures 3 and 4).
>
> Regarding claims 22-24 and 30-32, Miyauchi shows that the pair of antiferromagnetic layers includes an antiferromagnetic layer 126 that pins a ferromagnetic layer at zero degrees relative to a long axis of the free layer and an antiferromagnetic layer that pins a ferromagnetic layer 124 at ninety degrees relative to a long axis of the free layer (see figure 4).
>
> Regarding claims 25 and 33, Miyauchi discloses that the first and second antiferromagnetic layers have different blocking temperatures (column 8, lines 52-63).
>
> Regarding claims 26 and 34, Miyauchi shows a ferromagnetic layer 123 spaced from the free layer 121 by a nonmagnetic layer 122 (see figure 3).
>
> Regarding claims 27-28 and 35-36, since the thickness of the spacer layer of Miyauchi is the same as Applicant's, it is inherent that the thickness of the nonmagnetic layer is used to control the ferromagnetic exchange between the ferromagnetic layer and the free layer.

It is respectfully submitted that Miyauchi fails to teach the limitations of the present claims. It is also directed to a different problem than the present application, and also explicitly teaches away from the presently claimed invention.

Examiner cites Miyauchi, against independent claims 1 and 11. Claim 1 is reproduced above. In rejecting claim 1, Examiner cites Miyauchi at col. 7, lines 58-64:

While the exchange bias magnetic field applied by the magnetic domain control film 126 is required to have a magnitude that is large enough to create a single magnetic domain in the first ferromagnetic film 121 in, for instance, direction (X), if it becomes too large, the reversal of magnetization of the first ferromagnetic film 121 is dulled, reducing the magnetic field sensitivity. Consequently, it is desirable to set the exchange bias magnetic field applied by the magnetic domain control film 126 at the minimum whereby a single magnetic domain can be achieved in the first ferromagnetic film.

Rather than anticipating the present invention, Applicant respectfully submits that this passage teaches away from the ideas of the present invention, specifically claim1. The above passage of Miyauchi teaches that the bias field is too large, magnetic field sensitivity is reduced. Miyauchi then goes on to explain why this is undesirable, and offers a solution to prevent such a situation from occurring. Rather than expressly reducing sensitivity by providing a magnetic effect inducing device, Miyauchi teaches that such sensitivity must not be reduced, and that this can be accomplished according to Miyauchi's teachings of keeping the bias field at a minimum. This directly contradicts the claims of the present invention, which uses a magnetic effect inducing device reduces the sensitivity of the free layer.

Hence, it is respectfully submitted that Miyauchi fails to teach the limitations of at least claim 1, specifically, "wherein the at least one magnetic effect inducing device induces a magnetic field to the spin valve sensor to thereby reduce a sensitivity of a free layer of the spin valve sensor to applied magnetic fields." [Emphasis added.]

Independent claim 11, which includes similar features as claim 1, is also thereby believed distinguished from the cited reference.

For example, claims 9 and 19 include the limitation, "wherein the aligned atomic moments generate a longitudinal exchange bias field in the free layer that reduces the sensitivity of the free layer to applied magnetic fields." Examiner cites col. 7, lines 58-66, reproduced above, as teaching this reduction in sensitivity. However, the cited passage specifically teaches away from this result by directing those of skill in the art to set the bias field applied to a minimum, so that sensitivity is not decreased.

Response to Examiner's Arguments:

Further, in the response to Applicant's arguments, Examiner states that

> In response to applicant's argument that the present invention is directed to a reduced sensitivity spin valve sensor, a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. <u>If the prior art structure is capable of performing the intended use, then it meets the claim.</u>

It is respectfully submitted that the prior art structure is not capable of performing the intended use of the present invention. The Miyauchi reference is directed to a high sensitivity sensor, as indicated in the text at several points, for example, the Abstract: "The present invention is directed to a magnetic transducer element with outstanding productivity, with which the track width can be defined to a high degree of accuracy and required magnetic characteristics can be reliably imposed...." Anticipation focuses on whether a claim reads on the product or process a prior art reference discloses, not on what the reference broadly teaches. *Kalman v. Kimberly-Clark Corp.,* 713 F.2d 760, 218 U.S.P.Q. 781 (Fed. Cir. 1983). The mere fact that the prior art could be readily modified to arrive at the claimed invention does not render the claimed invention obvious; the prior art must suggest the desirability of such a modification. *In re Ochiai*, 71 F.3d 1565, 1570, 37 U.S.P.Q.2d 1127, 1131 (Fed. Cir. 1996); *In re Gordon*, 733 F.2d 900, 903, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984).

For the above reasons, it is respectfully submitted that the present claims are distinguished from the cited references. Favorable reconsideration of the claims is respectfully requested.

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APPENDIX OF CLAIMS

The text of the claims involved in the appeal are:

1. (Original) A reduced sensitivity spin valve sensor apparatus, comprising:

a spin valve sensor; and

at least one magnetic effect inducing device, wherein the at least one magnetic effect inducing device induces a magnetic field to the spin valve sensor to thereby reduce a sensitivity of a free layer of the spin valve sensor to applied magnetic fields.

2. (Original) The reduced sensitivity spin valve sensor apparatus of claim 1, wherein the at least one magnetic effect inducing device is at least one permanent magnet.

3. (Original) The reduced sensitivity spin valve sensor apparatus of claim 1, wherein the at least one magnetic effect inducing device is a pair of permanent magnet stabilizing elements.

4. (Original) The reduced sensitivity spin valve sensor apparatus of claim 1, wherein the at least one magnetic effect inducing device is magnetized in a longitudinal direction parallel to the free layer of the spin valve sensor.

5. (Original) The reduced sensitivity spin valve sensor apparatus of claim 3, wherein the permanent magnet stabilizing elements are cobalt-platinum/chromium magnets.

6. (Original) The reduced sensitivity spin valve sensor apparatus of claim 1, wherein the at least one magnetic effect inducing device reduces the spin valve sensor's propensity to saturate.

7. (Original) The reduced sensitivity spin valve sensor apparatus of claim 1, wherein the at least one magnetic effect inducing device is an antiferromagnet layer.

8. (Original) The reduced sensitivity spin valve sensor apparatus of claim 7, wherein the antiferromagnet layer aligns atomic moments in the free layer of the spin valve sensor.

9. (Original) The reduced sensitivity spin valve sensor apparatus of claim 8, wherein the aligned atomic moments generate a longitudinal exchange induced bias field in the free layer that reduces the sensitivity of the free layer to applied magnetic fields.

10. (Previously Presented) The reduced sensitivity spin valve sensor apparatus of claim 1, further comprising:

at least one insulating film; and

at least one magnetic shield, wherein the insulating film is one of alumina, silicon nitride and aluminum nitride.

11. (Original) A method of making a reduced sensitivity spin valve sensor apparatus, comprising:

providing a spin valve sensor; and

providing at least one magnetic effect inducing device, wherein the at least one magnetic

effect inducing device induces a magnetic field to the spin valve sensor to thereby reduce a sensitivity of a free layer of the spin valve sensor to applied magnetic fields.

12. (Original) The method of making a reduced sensitivity spin valve sensor apparatus of claim 11, wherein the at least one magnetic effect inducing device is at least one permanent magnet.

13. (Original) The method of making a reduced sensitivity spin valve sensor apparatus of claim 11, wherein the at least one magnetic effect inducing device is a pair of permanent magnet stabilizing elements.

14. (Original) The method of making a reduced sensitivity spin valve sensor apparatus of claim 11, wherein the at least one magnetic effect inducing device is magnetized in a longitudinal direction parallel to the free layer of the spin valve sensor.

15. (Original) The method of making a reduced sensitivity spin valve sensor apparatus of claim 13, wherein the permanent magnet stabilizing elements are cobalt-platinum/chromium magnets.

16. (Original) The method of making a reduced sensitivity spin valve sensor apparatus of claim 11, wherein the at least one magnetic effect inducing device reduces the spin valve sensor's propensity to saturate.

17. (Original) The method of making a reduced sensitivity spin valve sensor apparatus of claim 11, wherein the at least one magnetic effect inducing device is an antiferromagnet layer.

18. (Original) The method of making a reduced sensitivity spin valve sensor apparatus of claim 17, wherein the antiferromagnet layer aligns atomic moments in the free layer of the spin valve sensor.

19. (Original) The method of making a reduced sensitivity spin valve sensor apparatus of claim 18, wherein the aligned atomic moments generate a longitudinal exchange induced bias field in the free layer that reduces the sensitivity of the free layer to applied magnetic fields.

20. (Original) The method of making a reduced sensitivity spin valve sensor apparatus of claim 11, further comprising:

providing at least one insulating film; and

providing at least one magnetic shield, wherein the insulating film is one of alumina, silicon nitride and aluminum nitride.

21. (Original) The reduced sensitivity spin valve sensor apparatus of claim 1, wherein the at least one magnetic effect inducing device is a pair of antiferromagnetic layers.

22. (Original) The reduced sensitivity spin valve sensor apparatus of claim 21, wherein the pair of antiferromagnetic layers includes an antiferromagnetic layer that pins a ferromagnetic layer at zero degrees relative to a long axis of the free layer.

23. (Original) The reduced sensitivity spin valve sensor apparatus of claim 21, wherein the pair of antiferromagnetic layers includes an antiferromagnetic layer that pins a ferromagnetic layer at ninety degrees relative to a long axis of the free layer.

24. (Original) The reduced sensitivity spin valve sensor apparatus of claim 21, wherein the pair of antiferromagnet layers includes a first antiferromagnet layer pinned at zero degrees relative to a long axis of the free layer, and a second antiferromagnet layer pinned at ninety degrees relative to the long axis of the free layer.

25. (Original) The reduced sensitivity spin valve sensor apparatus of claim 24, wherein the first and second antiferromagnetic layers have different blocking temperatures.

26. (Original) The reduced sensitivity spin valve sensor apparatus of claim 21, further comprising a ferromagnetic layer spaced from the free layer by a nonmagnetic layer.

27. (Original) The reduced sensitivity spin valve sensor apparatus of claim 26, wherein a thickness of the nonmagnetic layer is used to control an amount of ferromagnetic exchange between the ferromagnetic layer and the free layer.

28. (Original) The reduced sensitivity spin valve sensor apparatus of claim 27, wherein the thickness of the nonmagnetic layer is approximately between 10 and 25 Angstroms.

29. (Original) The method of claim 11, wherein the at least one magnetic effect inducing device is a pair of antiferromagnetic layers.

30. (Original) The reduced sensitivity spin valve sensor apparatus of claim 29, wherein the pair of antiferromagnetic layers includes an antiferromagnetic layer that pins a ferromagnetic layer at zero degrees relative to a long axis of the free layer.

31. (Original) The reduced sensitivity spin valve sensor apparatus of claim 29, wherein the pair of antiferromagnetic layers includes an antiferromagnetic layer that pins a ferromagnetic layer at ninety degrees relative to a long axis of the free layer.

32. (Original) The reduced sensitivity spin valve sensor apparatus of claim 29, wherein the pair of antiferromagnetic layers includes a first antiferromagnetic layer that pins a first ferromagnetic layer at zero degrees relative to a long axis of the free layer, and a second antiferromagnetic layer that pins a second ferromagnetic layer at ninety degrees relative to the long axis of the free layer.

33. (Original) The reduced sensitivity spin valve sensor apparatus of claim 32, wherein the first and second antiferromagnetic layers have different blocking temperatures.

34. (Original) The reduced sensitivity spin valve sensor apparatus of claim 11, further comprising a ferromagnetic layer spaced from the free layer by a nonmagnetic layer.

35. (Original) The reduced sensitivity spin valve sensor apparatus of claim 34, wherein a thickness of the nonmagnetic layer is used to control an amount of ferromagnetic exchange between the ferromagnetic layer and the free layer.

36. (Original) The reduced sensitivity spin valve sensor apparatus of claim 35, wherein the thickness of the nonmagnetic layer is approximately between 10 and 25 Angstroms.